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Control electronics integrated in a brake, preferably a disc brake

The present invention relates to control electronics integrated in a brake, preferably a disc brake, according to the preamble of claim 1.

Control electronics integrated in a disc brake are known from DE 197 56 519 A1, for example. Control electronics of this type can be used to detect brake-specific parameters and to control and/or regulate brake components. This includes, for example, operation of an electromechanical wear adjustment system.

In order to be able to operate, the control electronics have an external power supply. The control electronics are able to interchange information with other vehicle systems via a corresponding connection, for example a CAN bus connection.

Control and monitoring systems are increasingly being used to detect and evaluate vehicle- or driving-specific data. In this case, sensors are predominantly also arranged on the vehicle wheels, examples of these sensors being tire pressure sensors, wheel force sensors, wheel rotational speed sensors or the like, and are used to determine specific parameters and transmit them to corresponding receiver and evaluation units, preferably in a contactless manner.

So-called "near-field telemetry systems", in which the sensor arranged on each vehicle wheel is passively operated, serve the purpose of contactless transmission. In this case, the sensor does not have its own power source, but is equipped only with a coil which is excited with electromagnetic pulses for transmitting the measurement signal by a transmitting and receiving device of the stationary evaluation and

control device. In addition, acoustic or optical excitation of the coil is also known (DE 100 44 266 A1).

In order to start operation of the sensor, an interrogation signal which charges a capacitor in the sensor is emitted by the evaluation electronics. The sensor is operated by means of the power stored in the capacitor.

If addressing by coding is necessary, a plurality of sensors are operated by the receiver/evaluation electronics. In this case, addressing can be performed by coding the signals in terms of interrogation and response, or by using different frequencies for the individual sensors.

In each case, the stationary evaluation and control device requires all the elements of an electronic apparatus, such as a power supply, a signal line or a CAN bus connection, a protective housing with cabling and/or a plug connection, and the like.

On account of the large number of sensors introduced in the meantime, a corresponding number of receiver/evaluation electronics systems which are fixed in place on the vehicle have to be provided, and this can naturally be achieved only with considerable physical complexity.

This requirement leads not only to corresponding production costs but consequently to a higher susceptibility to faults too, since a large number of receiver/evaluation electronics systems naturally form potential points of interference which stand in the way of optimum operation.

The present invention is therefore based on the object of further developing control electronics of this

generic type in such a way that their ability to operate is increased.

This object is achieved by control electronics which have the features of claim 1.

This physical design of the control electronics means that, in addition to the electronic components for monitoring and controlling the disc brake and/or brake-specific components, the electronic components, i.e. transceiver units, for the sensors can be combined to form one unit, these electronic components being present to monitor functional parts or functions which do not belong to the brake.

The integration of this additional transceiver unit means that the existing surrounding electronics can be used, as a result of which a considerable saving is made on subassemblies which would otherwise be necessary.

Installation is also simplified since now only the control electronics need be mounted, which results not only in a reduction in costs but also a reduction in susceptibility to faults which is correspondingly higher when there are a multiplicity of structural units than when there is only one.

The amount of space needed is equally minimized, and this is always desirable in vehicle construction and is achieved by the invention in an optimum manner.

The sensors may draw their operating power from an integrated power source, for example a battery.

In one particularly advantageous embodiment of the invention, the sensors are operated by means of the abovementioned telemetry system which is known per se and in which the power of the transmission signal from

the transceiver unit integrated in the brake is used.

The measurement signals from the respective sensors can be separately received, amplified and forwarded to evaluating vehicle systems by sequential actuation of said respective sensors.

The use of only one control electronics system for all of the sensors mounted in the wheel region and the resultant fact that separate control electronics systems are not needed means that cabling for supplying power and forwarding signals is dispensed with, as are a housing with plug connections, seals and fixing means, a power supply unit, overvoltage protection means and other electronic components.

The transceiver unit of the telemetry system can be combined with the existing control electronics of the brake and preferably be mounted on the existing printed circuit board. In this case, the arrangement of the transceiver unit is selected in such a way that the sensor signals can be received without interference.

Further advantageous embodiments of the invention are identified in the subclaims.

One exemplary embodiment of the invention is described below with reference to the attached drawing.

The single figure shows a schematic section illustration of a disc brake attached to a vehicle wheel.

The figure illustrates a disc brake as shown and described in WO 02/14708 A2 in principle. The disc brake has a brake caliper 1 which surrounds an upper circumferential region of a brake disc 3.

Both sides of the brake disc 3 have associated brake

linings 4 which can move and each have a lining material 4b applied to a brake lining support 4a.

The brake caliper 1 is fixed to a stationary axle flange 5 and cannot be moved from here. Said brake caliper is therefore a so-called fixed caliper.

In order to operate the brake linings 4 for the purpose of applying and releasing the brake, a brake application device 6 is provided on one side of the brake caliper and can be operated by means of a pneumatically operated brake cylinder 7. This brake application device presses the brake lining 4, which is on the right-hand side in this case, against the brake disc 3 and then the brake disc 3, which is movably guided on the axle, against the opposite brake lining 4 on the reaction side.

Each brake lining 4 has an associated adjustment device 8 which can be driven by an electric motor and adjusts the brake linings 4 as a function of wear.

The adjustment devices 8 are operatively connected to control electronics 9 which are an integral constituent part of the disc brake, are arranged on the outside of the brake caliper 1 in this case and are firmly connected to the brake caliper 1 in the present exemplary embodiment. The control electronics 9 have a power supply 10 and a data connection (not illustrated), for example a CAN bus connection, for interchanging information with other vehicle systems. Data can also be transmitted in a wire-free fashion by means of transmitters and receivers (not illustrated here).

As can be seen purely schematically in the figure, the disc brake and thus the control electronics 9 are arranged on the inside of a wheel 12 which has a hub 11, a rim 13 and a tire 14.

According to the invention, at least one transceiver unit 9b is provided in the control electronics and is operatively connected to at least one sensor which is independent of the brake and is part of or close to the wheel.

Sensors of this type are illustrated by way of example in the figure as tire pressure sensor 15 and rotational speed sensor 16 which can be provided with their own power supply, for example a battery, or can be operated by means of a telemetry system, as already mentioned.

In addition to said sensors, sensors of this type which are part of or close to the wheel can also be used and can determine, for example, the wheel bearing temperature, acceleration, vehicle inclination, distance or brake disc temperature, it being possible to use an ultrasonic or radar distance sensor to determine distances.

In each case, the associated transceiver unit 9b is in the control electronics 9, it being possible to provide a common transceiver unit 9b, which is preferably installed on a common printed circuit board 9a, for all of the sensors. In this case, the signals emitted by the sensors are correspondingly addressed or coded.

Reference symbols

1	Brake caliper
3	Brake disc
4	Brake lining
4a	Brake lining support
4b	Lining material
5	Axle flange
6	Brake application device
7	Brake cylinder
8	Adjustment device
9	Control unit
9a	Printed circuit board
9b	Transceiver unit
10	Power supply
11	Hub
12	Wheel
13	Rim
14	Tire
15	Air pressure sensor
16	Rotational speed sensor